Chapter 1

Introduction to Computers

Today, you can find **computers** almost everywhere. Microwave ovens, automobiles, thermostats and even wristwatches contain computer chips. In fact, computers are so common in modern society that everyone is affected by computer technology to some extent.

A computer is an electronic device that processes **data** and converts it into information. Computers run **programs**, which process data and perform tasks based on the instructions contained in the program. Because a computer program can evaluate data and then based on those evaluations, results are generated which can be used for large number of applications. Computers can process data with little assistance. Some examples for computer application are:

- Controlling space flight
- Landing airplanes
- Tracking inventory
- Printing books
- Turning on lights at a specified time
- Checking out groceries at the checkout counter

In this chapter, we will explore the history of computers and define the different types of computers available today. Also, the impact of computers on society will be discussed alongwith the introduction to programming languages.

1.1 History of Computers

The history of computers starts out about 5000 years ago, with the birth of the **abacus.** It is a wooden rack holding horizontal wires with beads strung on them. When these beads are moved around, according to programming rules memorized by the user, all regular arithmetic problems can be done.

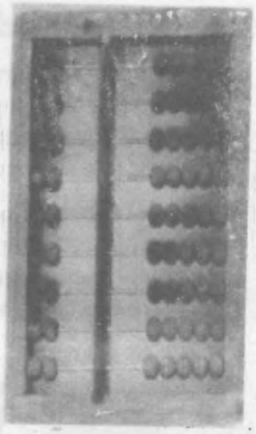

Figure 1.1: A simple ABACUS

1.1.1 Napier's Bones

John Napier, a Scottish mathematician, created logarithm tables to facilitate calculations. He also created a device using rods, also called Napier's Bones to perform arithmetic calculations. These rods were widely used by accountants and bookkeepers. Several people used the concept of logarithms to develop the slide rule. With a modern slide

rule you could not only perform the arithmetic operations, but also calculate squares, square roots, logs, sine, cosine, and tangent. The slide rule was used till the middle 70's.

1.1.2 Pascal's Pascaline Calculator

Pascal invented a machine that had a system of gears. A one-tooth gear engages its single tooth with a ten-tooth gear once every time it revolves. It must make ten revolutions to rotate the ten-tooth gear once. Numbers could be entered and cumulative sums obtained by cranking a handle. Pascal's calculator was not a commercial success because these devices could not be built with sufficient precision for practical use.

The German mathematician, **von Leibniz**, produced a machine that was similar to Pascal's but more reliable and accurate. Other mechanical calculators followed that were refinements on the designs of Pascal and Leibniz.

1.1.3 Charles Babbage

While Thomas of Colmar was developing the calculator, a series of very interesting development in computers was started in Cambridge, England by Charles Babbage, a mathematics professor. He began to design an automatic mechanical calculating machine, which he called a **difference engine**. By 1822, he had a working model to demonstrate. It was intended to be steam powered and fully automatic, including the printing of the results. Babbage continued to work on it for the next 10 years, but in 1833 he lost interest because he thought he had a better idea i.e. the construction of what would now be called a general purpose, fully program-controlled, automatic mechanical digital computer. Babbage called this idea an **Analytical Engine**. The idea of this design showed a lot of foresight, although this couldn't be appreciated until a full century later. The machine was supposed to operate automatically, by steam power, and require only one person.

1.1.4 Use of Punched Cards by Hollerith

In 1890, Herman Hollerith developed the first electro-mechanical punched card tabulator. The tabulator could read information that had been punched into cards. These cards were maintained in stack form. Solutions to different problems could be stored on different stacks of cards and accessed when needed.

Invention of punched cards opened a gate to modern data processing. IBM and other computer manufacturers came forward and started production of punched-card using computers. These computers could add, multiply and sort numbers. Data were fed and results were produced on punched cards.

As compared to today's machines, these computers were slow, usually processing 50 - 220 cards per minute, each card holding about 80 decimal numbers (characters). At that time, however, punched cards were a huge step forward. They provided a means for Input/Output (I/O), and memory storage on a huge scale.

1.1.5 Electronic Digital Computers

The start of World War II produced a large need for computer capacity, especially for the military. New weapons were made for which large number of calculations was needed. In 1942, John P. Eckert, John W. Machly, and their associates at the Moore school of Electrical

Engineering, University of Pennsylvania decided to build a high speed electronic computer to do the job. This machine was known as ENIAC (Electrical Numerical Integrator And Calculator).

1.1.6 The Modern Stored Program EDC

Fascinated by the success of ENIAC, the mathematician John Von Neumann in 1945 undertook a study of computation that showed that a computer should have a very simple, fixed physical structure, and yet be able to perform any kind of computation without the need for any physical change in the unit.

Von Neumann contributed a new awareness of how practical and fast computers should be built. These ideas, usually referred to as the **stored - program** technique, became essential for future generations of high speed digital computers and were universally adopted. According to Von Neumann theory *"Data and program can be stored in the same memory. Thus the machine can itself alter either its program or internal data"*.

As a result of these ideas, computing and programming became much faster, more flexible, and efficient.

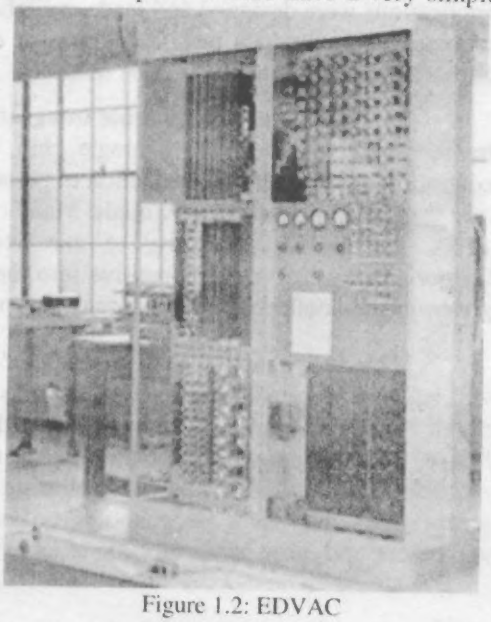

Figure 1.2: EDVAC

This group of computers included EDVAC (Figure 1.2) and UNIVAC, which were the first commercially available computers.

1.1.7 Advancement in 1950's – 1960's

In early 1950's, two important engineering inventions changed the image of the computer field. These discoveries were the magnetic core memories and the Transistor Circuit Elements. This quickly found its way into new models of digital computers.

These machines were very expensive and were also complicated to operate. Such computers were mostly found in large computer centers, government, and research and development laboratories. Those computers mostly worked on a single problem at a time. During this period, the major computer manufacturers began to offer a range of computer equipment with different prices, as well as accessories such as:

- Card Readers
- Printers
- Cathode-Ray-Tube

These were widely used in businesses for such things as:

- Accounting
- Payroll
- Inventory control
- Ordering Supplies
- Billing

Central Processing Units (CPUs) for these usages did not have to be very fast and were usually used to access large amount of records on a computer file. The computer systems were sold for applications, such as hospitals, banks, defense etc.

1.1.8 More Recent Advancements

The trend during the 1970's was moving away from very powerful single purpose computers toward a larger range of applications for cheaper computer systems. New applications were designed and made available for controlling a great range of manufacturing processes. Moreover, a new revolution in computer hardware was under the way, which allowed the size of computer to be reduced.

In 1980's, **very large scale integration** (VLSI), in which hundreds of thousands of transistors were placed on a single chip, became more and more common. The trend continued and led to the introduction of personal computers (PCs), which are smaller in size, inexpensive and used by individuals. Many companies introduced very successful PCs in the 1970s. In the manufacturing of computer processor chips, the Intel and Motorola Corporations were very competitive into the 1980s. In early 1980s, however, the Japanese government announced a big plan to design and build a new generation of computers.

This new generation, the so-called "fifth" generation, is using new technologies and will be capable of amazing features such as artificial intelligence. The cost of computers is rapidly lessening, and their convenience and efficiency are expected to increase in the early future. The computer field continues to experience huge growth. Computer networking, electronic mail, and electronic publishing are just a few of the applications that have grown in recent years. Advances in technologies continue to produce cheaper and more powerful computers and now computers are present in most of the homes, offices, and schools.

1.2 Computer Generations

1.2.1 First Generation – Vacuum Tubes

Computers of this generation used vacuum tubes (Figure 1.3) to perform calculations. **Vacuum tubes** were expensive because of the amount of material and skill needed to manufacture them. Vacuum tubes get hot and burn out. Computers of this generation were very large machines. Special rooms with air conditioning were needed to house them because of the heat generated by the vacuum tubes. The most important computers were ENIAC and UNIVAC – I.

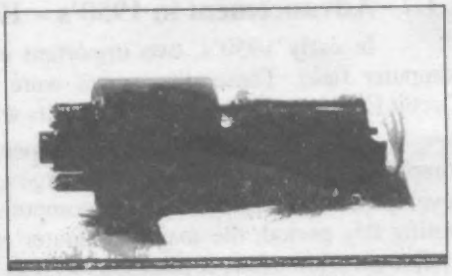

Figure 1.3: Vacuum Tube

ENIAC (Electronic Numerical Integrator and Calculator)

It was the first general-purpose electronic digital computer designed by John William Machly and John Eckert in 1942. The ENIAC was very heavy and large in size. It consumed 140 kilowatts of power and was capable of doing 5000 additions

per second. ENIAC was a decimal rather than a binary machine. That is numbers were represented in decimal form and arithmetic was performed in the decimal system. The major drawback of ENIAC was that it had to be programmed manually by setting switches and plugging and unplugging cables.

UNIVAC (Universal Automatic Computer)

In 1947, Eckert and Machly formed Eckert-Machly Computer Corporation to manufacture computers commercially. Their first successful machine was UNIVAC, which was delivered to US bureau of census in 1951. It was actually the first computer developed for commercial use. It was intended for both scientific and commercial applications.

1.2.2 Second Generation – Transistors

TRANSISTORS

Transistor was invented in 1947 by William Shockley, John Bardeen, and William Brattain.

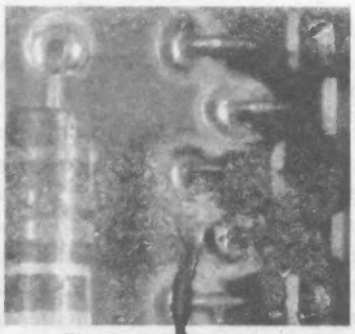

Figure 1.4 Transisters

Advantages

- 200 transistors are about the same size as one vacuum tube in a computer.
- Much less expensive than a vacuum tube.
- A transistor can work 40 times faster than a vacuum tube.
- Do not get hot and burn out like a vacuum tube.

The major change in the electronic computer was the replacement of vacuum tubes with transistors. The transistor was invented at Bell Labs in 1947. The transistor is smaller, cheaper, and dissipates less heat than a vacuum tube but can be used in the same way as a vacuum tube to construct computers.

As compared to first generation computers, second generation computers were smaller and had high processing speed. Most of these computers used magnetic core memory as internal storage. The second-generation computers enjoyed the use of more complex arithmetic and logic unit, use of low level and high level programming languages such as COBOL, BASIC, Pascal and Assembly etc. and provision of system software with the computers. Examples of second-generation computers are IBM 7094 series, IBM 1400 series, CDC 164 etc.

1.2.3 Third Generation - Integrated Circuits

IC (Integrated Circuit)

1. The concept of the IC was developed by Jack St. Clair Kilby in 1958.
2. First IC was invented and used in 1961.
3. An IC is about 1/4 square inch and can contain thousands of transistors

The major invention of third generation of computers was the development of IC (integrated circuit). A single IC chip contains thousands of transistors. The computer became smaller in size, faster, more reliable, and lower in price. And also became very common in medium to large-scale business. These computers used magnetic core memory as internal storage. The most successful computers of this generation were IBM system/360 and DEC PDP-8, the others were UNIVAC 1108, UNIVAC 9000 and IBM 370 etc.

1.2.4 Fourth Generation - Microprocessors

MICROPROCESSOR

1. The microprocessor is a complete processing circuitry on a chip. Ted Hoff produced the first microprocessor in 1971 for Intel, which was named as "Intel 4004 ".
2. Modern microprocessors are usually less than one square inch and can contain million of electronic circuits.
3. Used in many electronic devices today such as wristwatches, microwave ovens and cars.

Fourth generation of computers started with the invention of microprocessors. It revolutionized the computer world. Advancements were made in the integrated circuit technology. LSI (Large Scale Integrated Circuits) and VLSI (Very Large Scale Integrated Circuits) were designed which contributed to the invention of microprocessor. Computers of this generation used semiconductor memory, which increased the internal storage of computers. These computers have high processing speed, more internal storage and are smaller in size. Examples of fourth generation computers are apple Macintosh and IBM PC etc.

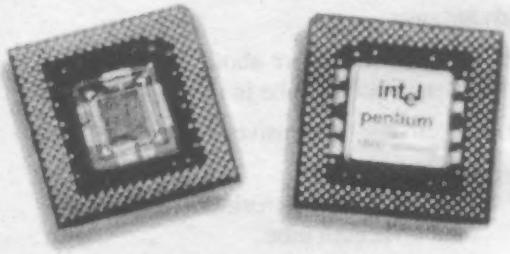

Figure 1.5: Microprocessors

1.2.5 Fifth Generation – Present and Beyond: Artificial Intelligence

Fifth generation computing devices, based on artificial intelligence, are still in development stage.Though there are some applications,such as voice recognition,that are being used today. The use of parallel processing and superconductors is helping to make artificial intelligence a reality. Quantum computation and molecular and nano-technology will radically change the face of computers in years to come. The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self-organization. .

1.3 Types of Computers

There are three types of computer:

- Analog Computers
- Digital Computers
- Hybrid Computers

1.3.1 Analog Computers

Analog computers use electronic or mechanical phenomena to model the problem being solved by using one kind of physical quantity to represent another.

The analog computer excels in solving dynamic problems and simulating complex physical systems. It has no way for man-machine interaction, recording and graphic display. High-speed computing elements, used to simulate mathematical functions, physical systems, and dynamic processes, are arranged in as much the same pattern as the physical system they represent.

Early special-purpose analog computers were the slide rule, the curvimeter and plainmeter, and the harmonic analyzer. In World War II, analog computing mechanisms were of great importance for gunfire control on warships. General-purpose analog computers were first built in 1930s.

1.3.2 Digital Computers

Digital computers process data in numerical form using digital circuits. The digital computers perform arithmetic and logic operations with discrete values. Digital computers are good at solving algebraic equations and even better at manipulating numbers. It is unbeatable for high-speed precision in arithmetic operations, data storage, and documentation. It can perform only one calculation at a time.

The results can be obtained in a variety of forms, such as printed tables, magnetic tape, and the familiar punched cards. While properly used in high-accuracy, high-volume numerical calculations, the digital computers are extremely good.

In early 1940s, Aiken built the first general-purpose digital computer called **Mark-1**. With the invention of digital computers, a new age of computing started. Today digital computers are widely being used in business, educational institutes, hospitals etc. for various purposes. Examples of digital computers are IBM PC, Apple's Macintosh computers etc.

1.3.3 Hybrid Computers

Hybrid Computers are the combination of analog and digital computers. Hybrid computers use analog-to-digital conversion and digital-to-analog conversion, and may input or output either analog or digital data. Dynamic problems that once took too long or were too difficult to handle can be solved in a reasonable period of time. These computers can produce highly accurate and precise results. These types of computers are used in robotics, medical labs etc.

1.4 Classification of Computer

Computers come in many different sizes and ranges of power, and different types of computer systems have varying capabilities. Today's computer systems are classified into following categories:

- Super Computer
- Mainframe Computer
- Mini Computers
- Micro computer

1.4.1 Supercomputers

Supercomputers are the most powerful computers made, and physically they are some of the largest. These systems are built to process huge amount of data, and the fastest supercomputers can perform more than 1 trillion calculations per second. Some supercomputers – such as Cray T90 system – can house thousands of processors. This speed and power make supercomputers ideal for handling large and highly complex problems that require extreme calculating power e.g. these computers help analyze and forecast global weather patterns, nuclear scientists use these computers to perform complex calculations etc.

Supercomputers can cost tens of millions of dollars and consume enough electricity to power dozens of homes. Because of their size and cost, supercomputers are relatively rare, used only by large corporations, universities, and government agencies that can afford them.

1.4.2 Mainframe Computers

The largest type of computer in common use is the mainframe. **Mainframe** computers are used in large organizations like insurance companies and banks where many people need frequent access to the same data, which is usually organized into one or more huge database. Airlines use large mainframe systems for flight scheduling, reservations, ticketing, and meeting a range of customer service needs.

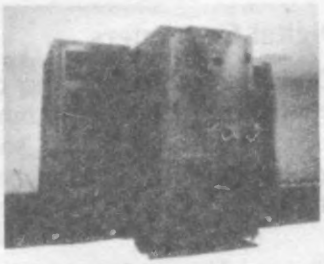

Figure. 1.6 Mainframe Computer

In traditional mainframe environment, each user works at a computer terminal. A **terminal** is a monitor and a keyboard connected to a mainframe. These computers are larger in size, expensive, can store huge amount of data (billions of records) and can support thousands of terminals. These computers are basically used in networked environment, as a single user can not utilize their full processing power. IBM S/390 is an example of mainframe computers.

1.4.3 Minicomputer

Minicomputers got their name because of their small size. These computers have less processing power than mainframe computers but have high processing power than microcomputers. Like mainframe, minicomputers can support number of user's input and output requirements. Normally minicomputers are used in networked environment as server machines. These computers are less expensive than mainframe computes and are ideal for organizations that could not afford mainframe or do not need the processing power of mainframe computers. The HP 3000 is an example of minicomputer.

1.4.4 Microcomputer

Microcomputers (also referred to as personal computers) are typically developed for individual users. These are less powerful machines as compared to minicomputers. In 1981, IBM called its first microcomputer the IBM-PC. Within a few years many other manufacturers copied the architecture and IBM compatible computers emerged in market.

One big factor of the popularity of microcomputers is the low price. PCs are getting powerful day by day because of the improvement in technology. That's why the difference between more powerful microcomputers and less powerful minicomputers is vanishing. The most powerful PCs are about as much powerful as a less powerful minicomputer can be. Individuals are using microcomputers for performing certain tasks. These are also used in business, education, and almost every field of life.

Microcomputers are available in different models i.e. desktop models, laptop computers, and pocket computers etc.

POCKET (PALMTOP) COMPUTER

Pocket computers have been designed to allow people to keep lots of information close to hand wherever they happen to be. A pocket computer has to have small, light batteries that last a long. These computers have special operating systems suited to pocket computers. One problem with small computers is that they don't have full-sized keyboards attached. These computers use special pens and touch-sensitive screens to enter data as well as a number of small buttons or keys.

Figure 1.7: Palmtop Computers

LAPTOP COMPUTER

The main aim of a laptop is that the persons using it can have all programs and data from their desktop computer on a portable computer.

The person using a laptop should be able to run all the same software on the laptop as runs on larger, desktop computers as laptop computers have the same types of operating system as desktop ones. Modern laptops can have floppy drives, CD-ROM drives and CD re-writers, and even DVD drives. They often have full-sized keyboards and a mouse or a touch-sensitive mouse pad. The screen is usually a large Liquid Crystal Display (LCD).

Figure 1.8: Laptop Computer

Laptops are usually much more expensive than desktop computers. They have expensive battery packs that have to power the hard disk, CD drives and LCD screen.

The batteries generally don't last as long as those in a pocket computer and may need recharging more than once a day, depending on the use.

DESKTOP COMPUTER

At the moment there are two main types of desktop computer available.

1. The Macintosh (made by Apple Computers)
2. Personal Computers (PC,s)

Macintosh is usually distinguished by its stylish look and bright colors (Figure1.9).

Figure1.9: Macintosh Computer

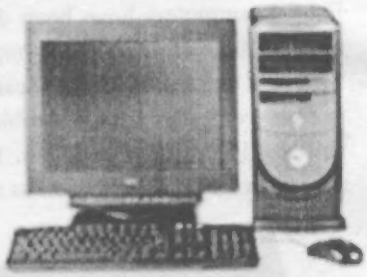

Figure 1.10 : IBM Compatible PC

When people talk about PCs (Figure1.10) they usually mean an IBM-compatible computer based on an Intel (or similar) microprocessor. The most common operating system for the PC is Microsoft Windows (latest version Windows XP) although other operating systems are available (e.g. Linux).

1.5 Impact of Computers and Internet on Society

There are numerous areas in which the increased ease and efficiency of computers have put a large impact. Probably the most important on our society is on information sharing.

EDUCATION

Educational institutes, from primary to university level, are using computers for various learning activities. A large number of learning programs (tutorials) are available on almost every subject. These provide a one-to-one interaction with the student. The trend of conducting online examinations is getting popular e.g. GRE, GMAT, SAT etc. are conducted online through out the world. Questions are marked by the computer, which minimize the chance of committing mistakes. It also makes it possible to announce results in time.

Distance learning is a new learning methodology. Computer plays the key role in this type of learning. Hundreds of institutes are offering distance-learning programs. The students are not required to come to the institute instead they are provided reading material and attend classes via **virtual classroom.** In a virtual classroom, the teacher deliver lecture at its own workplace while the students, connected to a network, may listen to him at their homes. They may put questions and answers are sent to them via email.

BUSINESS

Computer is now being widely used in business and industry. Computer information systems are used to keep track of huge transactions. They also allow transactions to be made from anywhere in the world. These are also used to control machines which manufacture products, keep track of customer's bills, analyze sales of various products in different localities on monthly and yearly basis; calculating and recording employ pays and performs various other tasks. These are also widely used in business community to reduce the administrative paperwork and cost.

ONLINE BANKING

The advent of the Internet and the popularity of personal computers presented an opportunity for the banking industry. For years, banking institutions have used powerful computers to perform millions of transactions. Nowadays, ATMs are installed everywhere; these are all computerized and connected together. These can be used to draw money from any branch of that bank at any time of the day. Customers are now also connected to the bank via personal computers, which allows them to see their bank account status at home.

Banks view computerized banking as a powerful tool to attract and retain new customers while eliminating costly paper handling and increasing competitive banking environment. Following are some of the advantages of online banking

- **Convenience:** Computerized online banking sites never close; they're available 24 hours a day, seven days a week, and they can be accessed from a computer.
- **Ubiquity:** If you're out of the country and a money problem arises, you can log on instantly to your online bank and make appropriate transactions.
- **Transaction speed:** Online bank sites generally execute and confirm transactions at quicker processing speed.
- **Efficiency:** You can access and manage all of your bank accounts, from one site.

APPLICATION IN RETAILING APPLICATIONS

Modern stores are quickly incorporating computer system for a number of reasons. Firstly these systems allow the billing of items to be done at great speed. They accept credit cards, allowing customer to purchase goods without cash.

The items at store are marked with "Bar Code". This is called as "Universal Production Code". This is a sequence of lines, which is read by a "Bar Code Reader". The price of the item is stored in this code and these are automatically added to the bill. The computer generates the receipt and the customer pays the bills.

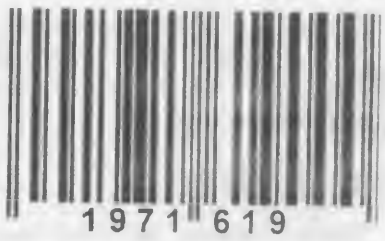

Figure 1.11: Universal Production Code

The computer along with generating the bills also updates the inventory list. This allows the store manager to see that which items are short and in more demand. Marketing experts can also use this information.

COMPUTER SIMULATIONS

Computer Simulation is the use of computer to represent the dynamic responses of one system by the change in behaviors of another system modeled after it. Computer simulations are widely used in educational institutes to make clear the understanding of the working of various systems e.g. simulation of aeroplane is a part of training of the pilot. It makes him /her clear the working of various parts of aeroplane. Simulation of river systems can be manipulated to determine the potential effects of dams, and irrigation network before any actual construction has taken place.

In educational institutes, simulations also have advantages over hands-on laboratory work such as allowing students to do more complicated and hazardous experiments, obtain results more quickly, and get a deeper understanding of the experiments. Simulations can include simple graphical or numerical representations of how chemical or physical experiments are carried out.

APPLICATION IN ENTERTAINMENT

The advancement of computer science has also helped entertainment industry. Nowadays computer can be used to watch television shows being broadcasted on Internet, watch movies, listen to music and play games.

Computers are also used to create animations and special effects for television shows, commercials, movies and cartoons. These allow them to add graphics and colorful displays in their shows.

Computer games are also becoming a big attraction for children and kids. The computers capability to portray graphics is constantly improving. Thus computer games are getting better and better each day. Computer games can take us into the excitement of competition by presenting 3D color images interactively. They can display colors and life like characters, animations, sounds and even videos.

Figure1.12: A car race computer game

Computer is also being used by music industry to create high quality music and sounds in less amount of time. Computerized electronic synthesizers are being used to store, modify and access a wide variety of sounds. New software are allowing musicians to create composition with less effort.

OTHER AREAS

Today computers are being used in many other areas to save time and cost. These include publishing where documents can be written and saved on a computer. This is accomplished by a word-processing application such as Microsoft Word. These applications allow the writers to correct and print the document in very short time. These documents can also be sent from one place to anther via Internet.

Computers are also being used in libraries to maintain and track record of books and library members. Any information regarding the book, its author or date of issue can be searched from the computer in seconds. They can also be issued warning when the books issued to them are over-due and must be returned immediately.

Thus computer has allowed people to work fast, saving time and money. Also it has helped in spreading information and knowledge via Internet. The future will allow many additional opportunities for the applications of automation to many areas of life.

1.6 Introduction to Programming Languages

Computer can perform various tasks depending upon the requirements of the user. In order to perform these tasks, computers need instructions which tell them how to execute the required task. *The set of instructions (executed by the CPU) to solve particular problem is called computer program (or simply program).*

A programming language defines a format for writing instructions in a specific order, which are to be executed by a computer. Programming languages also provide a framework for expressing algorithms. Programming languages are a way of communicating with the computer. The actual details of how programming concepts work are not so simple however, we will discuss them briefly.

1.6.1 Types of Computer Languages

There are many different computer languages available for writing programs. Each has its strengths and weaknesses and must be assessed based upon need. A language that is particularly well suited for one application may not work for another.

There are two types of computer languages:

- Low Level Languages
- High Level Languages

LOW LEVEL LANGUAGES

Low level languages provide the programmer with a high degree of control, but they require a detailed knowledge of the hardware to be used. They are really only required for advanced programming needs. There are two main types of low level languages.

- Machine language
- Assembly language

MACHINE LANGUAGE

The processor within a computer can perform various operations, each of which is identified by an operation code (or opcode). It is possible to write a program directly in machine code by using the correct opcodes in the correct sequence into memory, alongwith the required data values and parameter values. The program could be depicted as a series of binary numbers. This however is not a very practical way to write a program. Apart from being complex and time-consuming, programs

written in this way would tend to be error prone and would be very difficult to debug. For this reason, programs are generally written in a language which is easier for humans to understand and can also be translated into machine code for the processor to understand.

ASSEMBLY LANGUAGE

Assembly language is very close to machine language. The commands are represented in Assembly Language by short names called mnemonics (pronounced as Ne-Monics). For example ld means Load Accumulator with a particular data value. Because each type of processor has a different set of operations, different processors use different Assembly languages. Assembly language programming is complex but it provides a much higher degree of control than high level languages. Programs written in Assembly Language code are translated into machine code by an assembler. Machine code can also be converted back into assembly code using a deassembler.

HIGH LEVEL LANGUAGES

High level languages are close to human languages and far from the machine language. These are machine independent languages which are also known as "third generation" languages. These languages consist of English words, basic mathematical symbols and a few punctuation characters. These languages allow simple statements to be expressed concisely. Each high level language has its own language translater The history of some of the major programming languages is given below.

- **FORTRAN (FORmula TRANslation)**

  In 1957, FORTRAN appeared as the first major high level languages appeared in the form of FORTRAN. FORTRAN stands for Formula Translation. The language was designed at IBM for scientific computing. It was mainly used for scientific purposes.

- **BASIC (Beginners All-purpose Symbolic Instruction Code)**

  BASIC was designed to allow students to write programs using time-sharing computer terminals. BASIC was intended for easy learning programming concepts. The design principles of BASIC were:

  - Be easy for beginners to use.
  - Be a general-purpose language.
  - Allow advanced features to be added for experts (while keeping the language simple for beginners).
  - Be interactive.
  - Provide clear and friendly error messages.
  - Respond fast for small programs.
  - Not require an understanding of computer hardware.
  - Shield the user from the operating system.

- **COBOL (Common Business Oriented Language)**

  Though FORTRAN was good at handling numbers, it was not so good at handling input and output, which mattered most to business computing. COBOL was designed as the language for businessmen. Its only data types were numbers and strings of text. A COBOL program consists of four or five major sections. COBOL statements also have a very English-like grammar, making it quite easy to learn. Because of its simplicity it had been very popular among business community.

- **LISP**

  LISP stands for List Processing language. It was designed for Artificial Intelligence (AI) research. Because it was designed for such a highly specialized field, its syntax (programming rules) was very different from ordinary languages.
  It has the unique ability to modify itself, and hence grow on its own.
  It is being used even today because it is highly specialized.

- **PASCAL (PASCAL is a language named after a Scientist Pascal)**

  Pascal was designed in a very orderly approach; it combined many of the best features of the languages in use at the time, COBOL, FORTRAN, and ALGOL. While doing so, many of the irregularities of these languages were cleaned up, which helped it to gain popularity. The combination of features, input/output and solid mathematical features, made it a highly successful language.

- **C and C++**

  C was developed in 1972 by Dennis Ritchie while working at Bell Labs. C is very commonly used to program operating systems such as UNIX, Windows, and Macintosh OS etc. It is also very useful for compiler writing.

  C++ was an extension to C using OOP (Object Oriented Programming) concept, while maintaining the speed of C. C++ is most often used in simulations, such as games. It is the language of choice in today's Computer Science courses.

- **Visual Basic**

  It was the first visual development tool from Microsoft, and it was designed to compete with C, C++, Pascal and any other well known programming languages. When it came out, Visual Basic wasn't very successful. It wasn't until Microsoft released VB 2.0 in 1993 that people really started to discover the power of the language, and when Microsoft released VB 3.0 it had become

the fastest growing programming language in the market. By now, Visual Basic has earned itself the status of a professional programming language.

VB is most often used today to create quick and simple interfaces to other Microsoft products such as Excel and Access without needing a lot of code, though it is possible to create full applications with it.

- **JAVA**
  Sun Microsystems began developing a language with the primarily purpose to control microprocessors used in consumer items such as cable receivers, VCR's, toasters, and also for personal data assistants (PDA). Java offers powerful capabilities of network programming, Internet applications and GUI (Graphical User Interface).

1.7 Introduction to Language Translators

Language translators are the programs that translate a high or level language program into machine code.

Program written in any language is first analyzed by a special piece of software. This piece of software is designed by the language designer. The software checks the program for errors, optimizes the code and generates machine language for that program. All the software available for this purpose can be categorized into three main categories.

- Assembler
- Compiler
- Interpreter

1.7.1 Assembler

An assembler is a program that translates an assembly language program into machine code.

1.7.2 Compiler

A compiler is a program that translates a source program (written in some high-level programming language) into machine language (or machine code). A compiler first reads the whole program before executing it.

1.7.3 Interpreter

An interpreter on the other hand, looks at each line of the program, decides what that line means, checks it for possible errors and then executes that line. If one of the lines is executed repeatedly, it must be scanned and analyzed each time, greatly slowing down the solution of the problem at hand.

Exercise

1. Describe Charles Babbage work in the history of computers?
2. Describe the advancements in the computers during the 1950's and 1960's.
3. Write a note on different computer generations, briefly explaining their features.
4. What is the difference between a digital and an analog computer?
5. Write short notes on the following:
   a. Pocket Computers
   b. Laptop Computers
   c. Micro Computers
6. Describe the Impact of computers and internet on society.
7. Define Computer. Briefly describe classification of computers.
8. Modern computers are based on stored program concept. Who introduces the concept? Discuss his/her contribution in the history of computers.
9. Briefly name and describe some of the applications of computers.
10. What is the difference between low level and high level languages?
11. Discuss some negative aspects of the use of Internet in our society.
12. What is a compiler and an interpreter?
13. Write a note on the following:
    a. Visual Basic
    b. LISP
    c. C/C++
14. Fill in the blanks.
    (i) A computer is an electronic device that processes _____ and converts it into information that people can use.
    (ii) Blaise Pascal is usually credited for building the first _____ computer in 1642
    (iii) John von Neumann developed the idea of the _____
    (iv) The DOS operating system was developed by_____
    (v) _____ computers are a combination of analog and digital
    (vi) When people talk about _____ they usually mean an 'IBM-compatible' computer based on an Intel (or similar) microprocessor.
    (vii) _____ was the major invention of third generation of computers.
    (viii) ENIAC stands for _____
    (ix) Cray T90 is an example of _____
    (x) Java is a(n) _____ language
15. Mark as True or False
    (i) The history of computers starts out about 2000 years ago, with the birth of the abacus.
    (ii) Charles Babbage is usually credited for building the **first digital computer** in 1642.

(iii) Charles Babage began to design an automatic mechanical calculating machine, which he called a difference engine.

(iv) The discoveries that changed the image of computer field were the magnetic core memory and the Transistor Circuit Element.

(v) First generation computers used transistors instead of vacuum tubes for performing calculations.

(vi) FORTRAN was the most popular language of first generation of computers.

(vii) LISP is used in Artificial Intelligence.

(viii) Slide-rule is an example of analog computers

(ix) Assembler is a program that assembles windows commands

(x) First of all Apple's Macintosh computer introduces GUI

(xi) Supercomputer does not need any instruction to perform a task

16. Choose the correct option:

(i) Which of the following is not a high level language?

a. Fortran **b.** Basic **c.** C and C++ **d.** Assembly Language **e.** Visual Basic

(ii) Which of the following is not true about Personal Computers?

a. The PC was introduced by IBM in 1981.

b. Uses the DOS or Windows operating system developed by Microsoft Corporation.

c. They are analogue machines. **d.** Computers are easy to use.

e. People could do work at home that would be transferable to the company's computer.

(iii) The third generation computers used

a. Vacuum Tubes **b.** Integrated circuits **c.** Transistors **d.** Microprocessors

(iv) A terminal consists of

a. a keyboard, mouse and printer **b.** keyboard and monitor

c. mouse and monitor **d.** system unit and I/O devices

(v) Minicomputer is

e. faster than microcomputer **f.** expensive than micro computer

g. smaller in size than microcomputer **h.** a and b **i.** a and c

Answers

Q.14

(i) data (ii) Digital (iii) Stored-program (iv) IBM (v) Hybrid (vi) Personal Computer
(vii) Integrated Circuit (viii) Electronic Numerical Integrator and Calculator (ix) Supercomputer
(x) High level programming language

Q.15

(i) T (ii) F (iii) T (iv) T (v) F
(vi) F (vii) T (viii) T (ix) F (x) T

Q.16

(i) d (ii) c (iii) B (iv) b (v) d